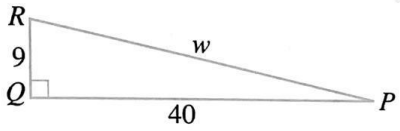
Topical Worksheet: Trigonometry
Secondary 3 Mathematics

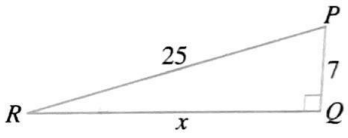
BASIC

1. In each of the following triangles, the unit of length is cm.
   (i) Find the unknown marked side.
   (ii) State the values of $\sin P$, $\cos P$ *and* $\tan P$.

(a)



(b)



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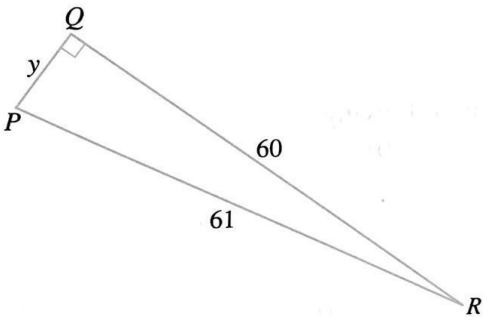

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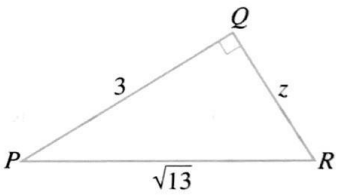
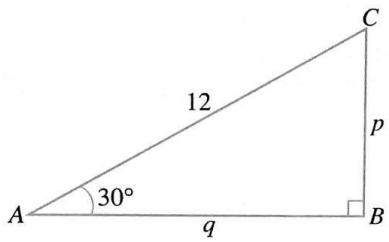


2. Find the values of the following, giving your answers correct to 4 significant figures.
   (a) $\sin 46°$
   (b) $\cos 85°$
   (c) $\tan 74°$
   (d) $\cos 155°$
   (e) $\tan 35° - \sin 87°$
   (f) $\cos 122° \times \tan 10°$
   (g) $\sin 92° + \cos 55° \div \tan 39°$
   (h) $\frac{\tan 64° - \sin 126°}{\cos 125° + \sin 60°}$

3. Find the acute angle x, in degrees, in each of the following. Give your answers correct to 1 decimal place.
   (a) $\sin x = 0.683$
   (b) $\cos x = 0.317$
   (c) $\tan x = 4.64$
   (d) $\sin x = \frac{1}{4}\cos 30°$
   (e) $\cos x = \tan 25° \times \sin 10°$
   (f) $\tan x = \sin 70° + \cos 12°$

4. In each of the following triangles, the unit length is cm. Find
   (i) The unknown marked sides,
   (ii) The area of the triangle.

(a)



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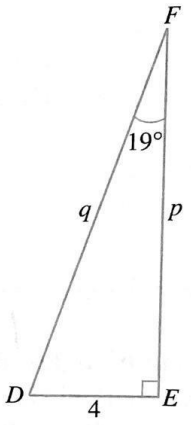

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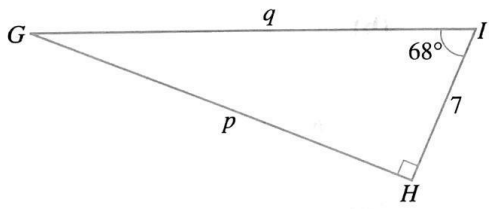

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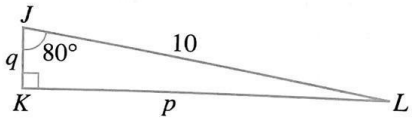
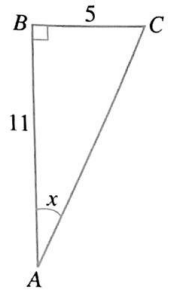


5. Find, the value of the angle, x, in degrees, in each of the following.

(a)



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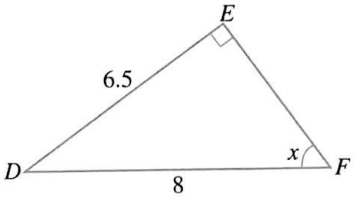

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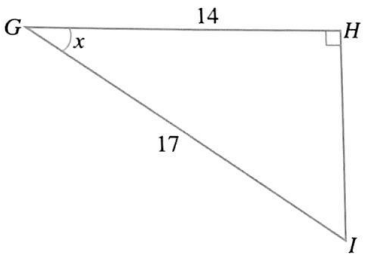

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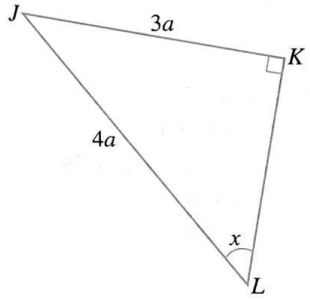

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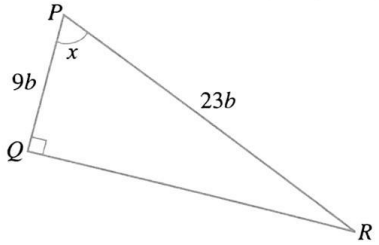

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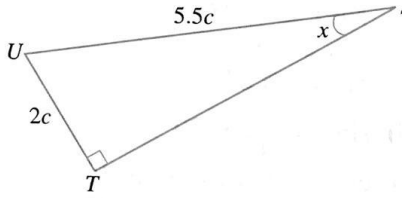
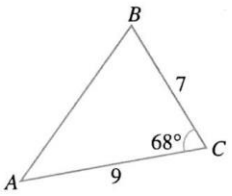


6. (a) Express each of the following in terms of the same trigonometric ratio of an acute angle, without finding its value.
   (i) $\cos 126°$
   (ii) $\cos 97°$
   (iii) $\sin 171°$
   (iv) $\sin 143°$

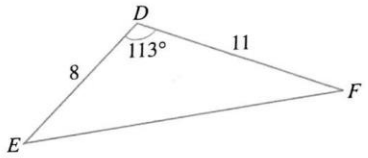
   (b) Express each of the following in terms of the same trigonometric ratio of an obtuse angle, without finding its value.
   (i) $\sin 17°$
   (ii) $\sin 78°$
   (iii) $\cos 36°$
   (iv) $\cos 59°$

7. Find the area of each of the following figures. The unit of length is cm.

(a)



(b)



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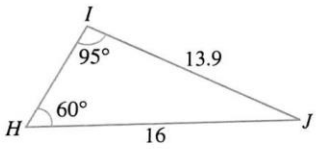

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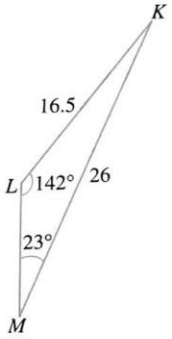

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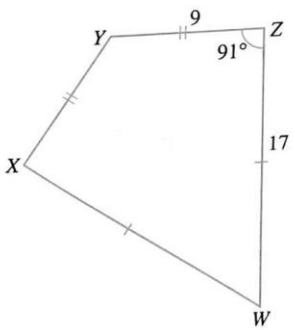

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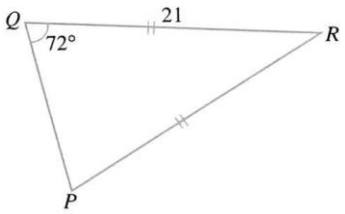
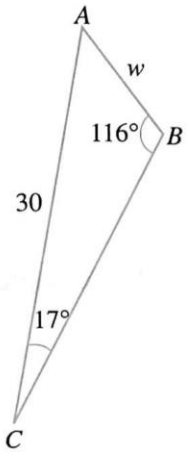


8. Find the unknown side w in each of the following triangles. The unit of length is cm.

(a)



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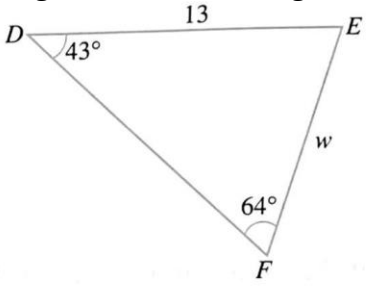

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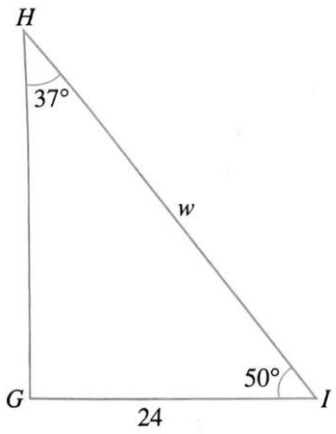

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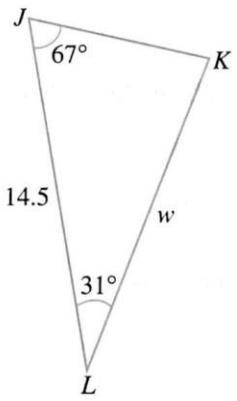
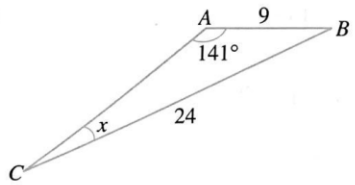
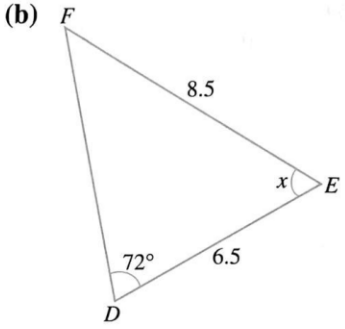


9. Find the unknown angle x in each of the following triangles.

(a)



(b)



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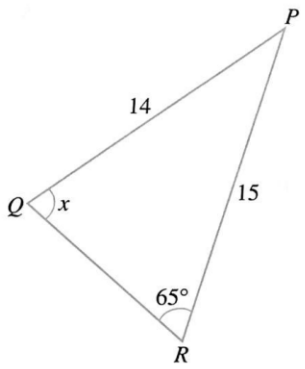

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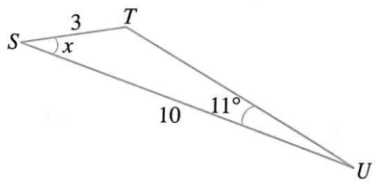
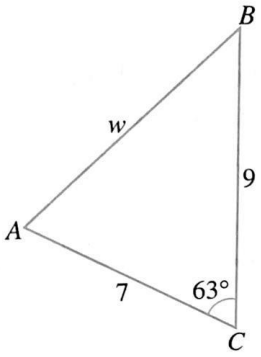
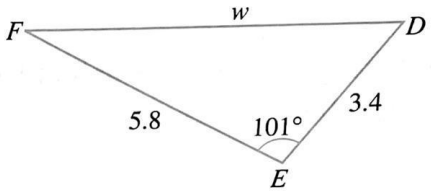


10. Find the unknown side w in each of the following triangles. The unit of length is cm.

(a)



(b)



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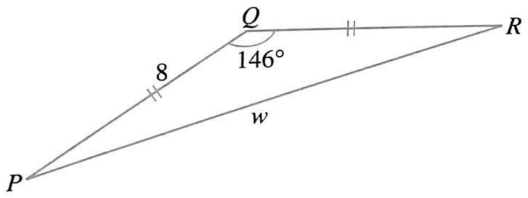

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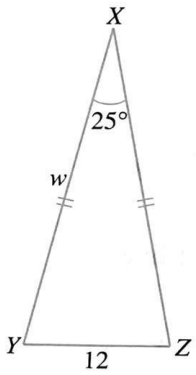
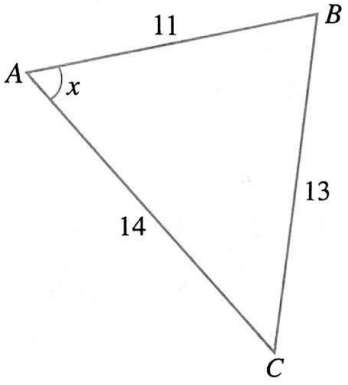
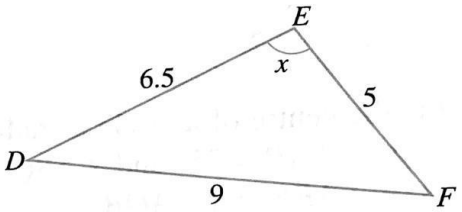


11. Find the unknown angle x in each of the following triangles.

(a)



(b)



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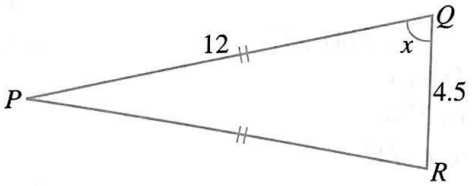
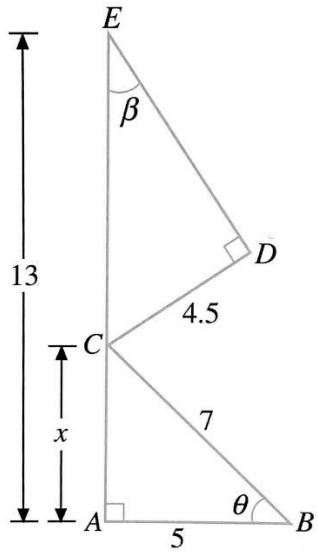


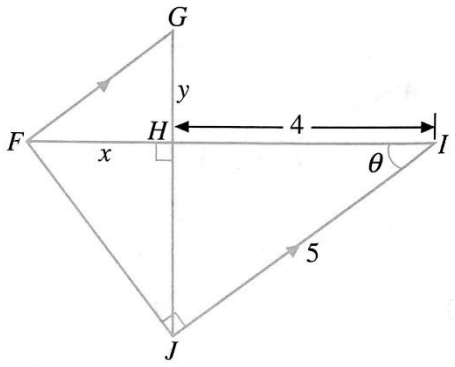
INTERMEDIATE

12. In each of the following diagrams, the unit of length is cm. Find the unknown marked sides and angles.

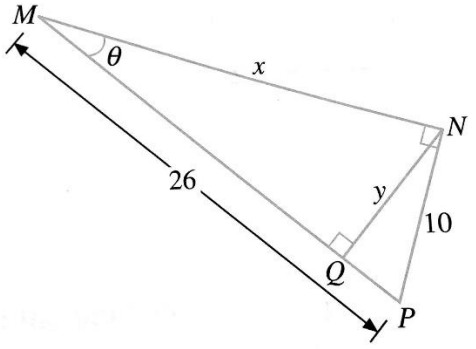
(a) ACE is a straight line.



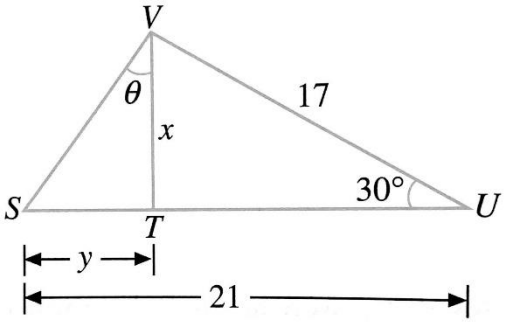
(b) FI and GJ intersect at H.



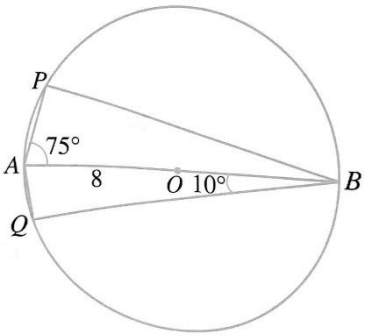
(c) MQP is a straight line.



(d) STU is a straight line.



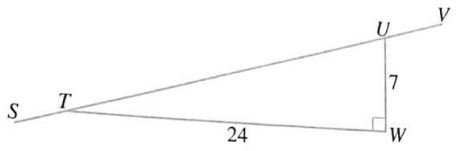
13. In the diagram, O is the centre of a circle of radius 8 cm and AB is a diameter of the circle. $\angle BAP = 75°$ and $\angle ABQ = 10°$.
    (a) State the sizes of $\angle APB$ and $\angle AQB$.
    (b) Find the lengths of AP, BP, AQ and BQ.
    (c) Hence, calculate the area of the quadrilateral $APBQ$.



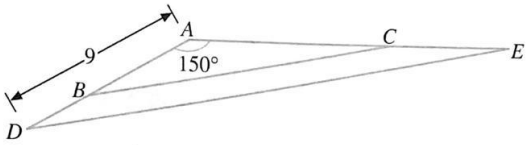
14. In each of the following, find the possible values of x for $0° \leq x \leq 180°$.
    (a) $\sin x = 0.257$
    (b) $\cos x = -0.415$
    (c) $\sin x = \cos 16°$
    (d) $\cos x = \sin 174°$
    (e) $\sin x = \sin 49°$
    (f) $\cos x = -\cos 71°$

15. (a) Suppose that $\tan P = \frac{\sqrt{5}}{2}$ and P is an acute angle. Without calculating P, find the value of
    (i) $\sin P$,
    (ii) $\cos P$.
    (d) Suppose that $\sin Q = \frac{\sqrt{45}}{7}$ and Q is an obtuse angle. Find the value of $\cos Q$ without calculating Q.
    (e) Suppose that $\cos R = -\frac{\sqrt{5}}{3}$ and $0° \leq R \leq 180°$. Find the value of $\sin R$ without calculating R.

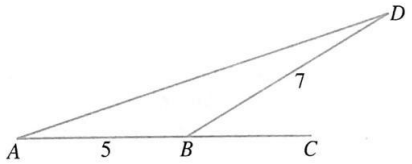
16. In the diagram, $STUV$ is a straight line, $UW = 7$ cm, $TW = 24$ cm and $\angle UWT = 90°$.
    (a) Find the length of TU.
    (b) Find the value of
        (i) $\sin \angle$ VUW,
        (ii) $\cos \angle VUW$,
        (iii) $\sin \angle$ STW
        (iv) $\cos \angle$STW



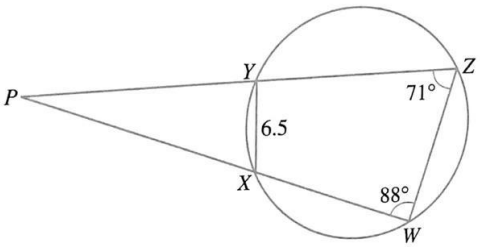
17. In the diagram, the area of $\triangle ADE$ is 36 cm^2, $AD = 9$ cm, $AB:AD = 3:5$, $AC:AE = 5:8$ and $\angle DAE = 150°$.
    (a) Find the length of
        (i) AB
        (ii) AE
        (iii) AC
    (b) (i) Find the area of $BCED$.
        (ii) Express the area of $BCED$ as a percentage of the area of $\triangle ADE$.



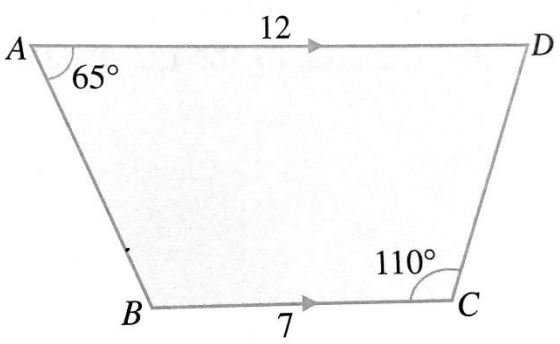
18. In the diagram, ABC is a straight line, $\cos \angle CBD = \frac{3}{5}$, $BA = 5$ cm and $BD = 7$ cm.
    (a) State the value of $\cos \angle ABD$.
    (b) Find the value of $\sin \angle CBD$.
    (c) State the value of $\sin \angle ABD$.
    (d) Find the area of $\triangle ABD$.



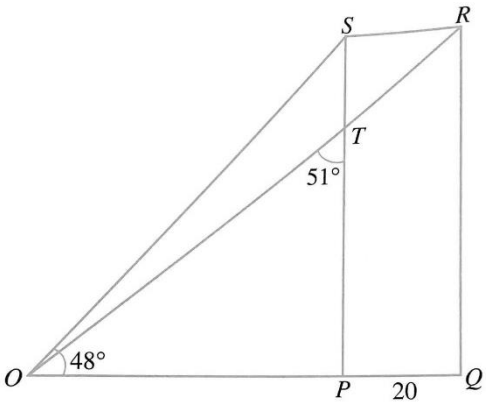
19. In the diagram, W, X, Y and Z are points on a circle. WX and ZY are produced to meet at the point P, $XY = 6.5$ cm, $\angle WZY = 71°$ and $\angle XWZ = 88°$.
    (a) Find $\angle XPY$.
    (b) Find
        (i) The perimeter of $\triangle XPY$,
        (ii) The area of $\triangle XPY$.



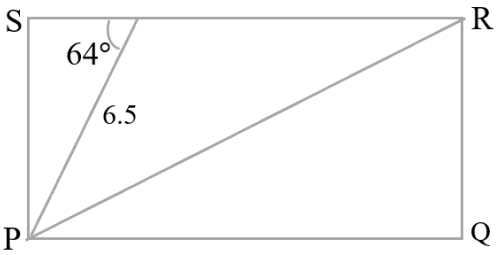
20. In the quadrilateral $ABCD$, $AD//$BC, $AD = 12$ cm, $BC = 7$ cm, $\angle BCD = 110°$. Find
    (a) $\angle$ADC,
    (b) The length of AB,
    (c) The length of CD,
    (d) The area of $ABCD$.



21. In the diagram, $PQRS$ is a rectangle, P is a 22.
    point on the line OQ and the lines OR and PS intersect at the point T. $PQ = 20$cm, $\angle SOQ = 48°$ and $\angle OTP = 51°$.
    (a) Find $\angle ROS$.
    (b) Find the length of
        (i) OS,
        (ii) OR,
        (iii) OP.



22. In the diagram, $PQRS$ is a rectangle and T is a point on the side SR. $PQ = 15$ cm, $PT = 6.5$ cm and $\angle STP = 64°$.
    Find
    (a) The lengths of RQ and RP,
    (b) $\angle RPT$,
    (c) The area of $\triangle RPT$.



ANSWERS

1. (a)(i) 41 (ii) $\sin p = \frac{9}{41},\ \cos p = \frac{40}{41},\ \tan p = \frac{9}{40}$
   (b)(i) 24 (ii) $\sin p = \frac{24}{25},\ \cos p = \frac{7}{25},\ \tan p = \frac{24}{7}$
   (c)(i) 11 (ii) $\sin p = \frac{60}{61},\ \cos p = \frac{11}{61},\ \tan p = \frac{60}{11}$
   (d)(i) 2 (ii) $\sin p = \frac{2}{\sqrt{13}},\ \cos p = \frac{3}{\sqrt{13}},\ \tan p = \frac{2}{3}$
2. (a) 0.7193 (b) 0.087 16 (c) 3.487
   (d) -0.9063 (e) -0.2984 (f) $-0.093\ 44$
   (g) 1.708 (h) 4.244
3. (a) 43.1° (b) 71.5° (c) 77.8°
   (d) 12.5° (e) 85.4° (f) 62.5°
4. (a)(i) $p = 6, q = 10.4$ (ii) 31.2 cm^2
   (b)(i) $p = 11.6, q = 12.3$ (ii) 23.2 cm^2
   (c)(i) $p = 17.3, q = 18.7$ (ii) 60.6 cm^2
   (d)(i) $p = 9.85, q = 1.74$ (ii) 8.55 cm^2
5. (a) 24.4° (b) 54.3° (c) 34.6°
   (d) 48.6° (e) 67.0° (f) 21.3°
6. (a)(i) $-\cos 54°$ (ii) $-\cos 83°$
   (iii) $\sin 9°$ (iv) $\sin 37°$
   (b)(i) $\sin 163°$ (ii) $\sin 102°$
   (iii) $-\cos 144°$ (iv) $-\cos 121°$
7. (a) 29.2 cm^2 (b) 40.5 cm^2 (c) 47.0 cm^2
   (d) 55.5 cm^2 (e) 153 cm^2 (f) 130 cm^2
8. (a) 9.76 (b) 9.86 (c) 39.8
   (d) 13.5
9. (a) 13.7° (b) 61.3° (c) 76.2° or 103.8°
   (d) 28.5° or 129.5°
10. (a) 8.53 (b) 7.26 (c) 15.3
    (d) 27.7
11. (a) 61.3° (b) 102.2° (c) 79.2
12. (a) $x = 4.90, \theta = 44.4°, \beta = 33.7°$
    (b) $x = 2.25, y = 1.6875, \theta = 36.9°$
    (c) $x = 24, y = 9\frac{3}{13}, \theta = 22.6°$
    (d) $x = 8.5, y = 6.28, \theta = 36.4°$
13. (a) $\angle APB = 90°, \angle AQB = 90°$
    (b) $AP = 4.14$ cm, $BP = 15.5$ cm, $BQ = 15.8$ cm, $AQ = 2.78$ cm
    (c) 53.9 cm^2
14. (a) $x = 14.9°\ or\ x = 165.1°$ (b) $x = 114.5°$
    (c) $x = 74°\ or\ x = 106°$ (d) $x = 84°$
    (e) $x = 49°\ or\ x = 131°$ (f) $x = 109°$
15. (a)(i) $\frac{\sqrt{5}}{3}$ (ii) $\frac{2}{3}$
    (b) $-\frac{4}{7}$ (c) $\frac{2}{3}$
16. (a) 25cm
    (b)(i) $\frac{24}{25}$ (ii) $-\frac{7}{25}$ (iii) $\frac{7}{25}$
    (iv) $-\frac{24}{25}$
17. (a)(i) 5.4 cm (ii) 16 cm (iii) 10cm

(b)(i) 22.5 cm^2 (ii) 62.5%

18. (a) $-\frac{3}{5}$ (b) $\frac{4}{5}$ (c) $\frac{4}{5}$
    (d) 14 cm^2
19. (a) 21° (b)(i) 41.8 cm (ii) 55.7 cm^2
20. (a) 70° (b) 6.64 cm (c) 6.41 cm
    (d) 57.2 cm^2
21. (a) 9°
    (b)(i) 80.5 cm (ii) 95.0 cm (iii) 53.8 cm
22. (a) $RQ = 5.84$ cm, $RP = 16.1$ cm
    (b) 42.7° (c) 35.5 cm^2