11.   What is the reference angle for 300°?

(A)   150°   (B) 30°   (C) 300°   (D) 60°

12.   Solve for x for $0^0 \le x \le 360^0$: $\cos x = \dfrac{-1}{\sqrt{2}}$

(A) $45^0 \ and \ 135^0$ (B) $225^0 \ and \ 135^0$ (C) $315^0 \ and \ 135^0$ (D) $45^0 \ and \ 315^0$
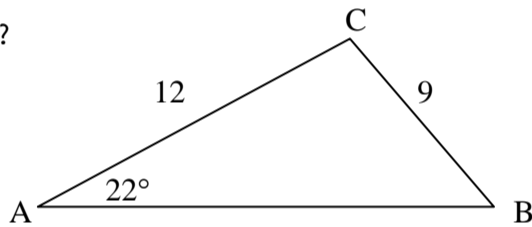
13.   Which equation would you use to solve for x?

(A) $\dfrac{\sin 100}{x} = \dfrac{\sin 45}{6}$

(B) $\dfrac{\sin 35}{6} = \dfrac{\sin 45}{x}$

(C) $\dfrac{\sin 100}{6} = \dfrac{\sin 35}{x}$

(D) $\dfrac{\sin 100}{x} = \dfrac{\sin 35}{6}$
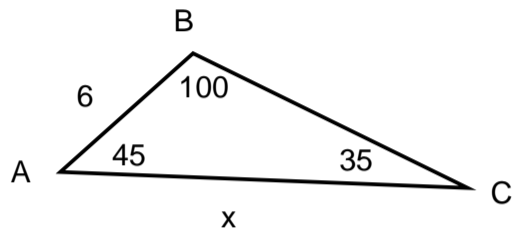
14.   How many possible answers are there for $\angle B$?

(A)   0
(B)   1
(C)   2
(D)   not possible to determine

15.   In $\triangle ABC$ if $\sin B = \dfrac{1}{2}$, what are the two possible values for angle B?

(A)   30⁰ and 330⁰
(B)   60⁰ and 120⁰
(C)   30⁰ and 150⁰
(D)   60⁰ and 30⁰

16.   If you are given the lengths of 2 sides and the included angle in a triangle and you want to find the measure of the side across from the given angle, which formula must you use?
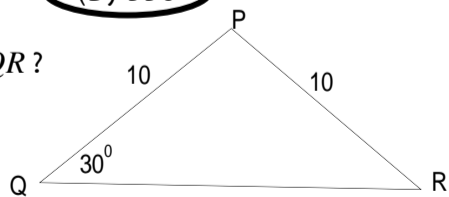
(A) Area of a triangle formula   (B) Law of Cosines
(C) Law of Sines   (D) Law of Tangents

17.   Which of the following angles has the same sine ratio as $\sin 210^0$?

(A) 150⁰   (B) 210⁰   (C) 30⁰   (D) 330⁰
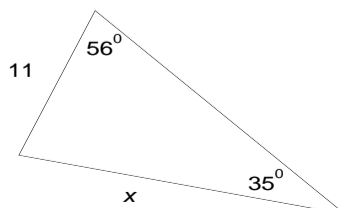
18.   What is the EXACT length of side QR in isosceles $\triangle PQR$?

(A) $5\sqrt{3}$ (B) 10   (C) $10\sqrt{3}$ (D) 20
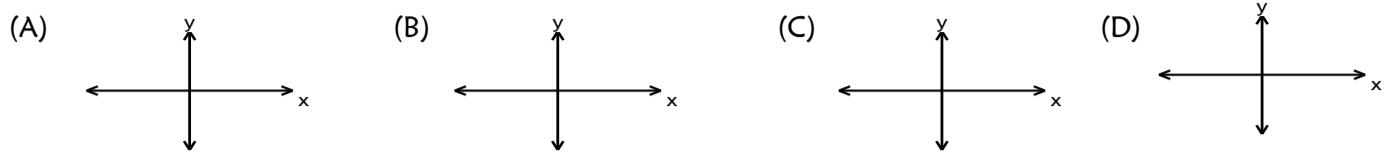
19.   Find the value of x.

(A)   15.9
(B)   16.3
(C)   17.6
(D)   7.6

20. | OMIT

(A)   (B)   (C)   (D)
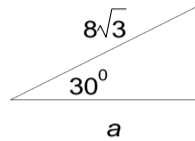
21.   The terminal arm of 320^0 is closest to ___.

(A)   positive x axis   (B) negative x axis   (C) positive y axis   (D) negative y axis

22.   What is the EXACT length of side a in this triangle?

(A) $16\sqrt{3}$
(B)   12
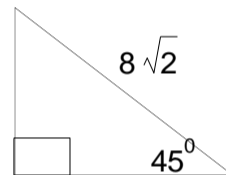(C) $4\sqrt{3}$
(D) $\dfrac{16}{\sqrt{3}}$

23.   Which angle below does not have a reference angle of 20^0 ?

(A) 20^0 (B) 340^0 **(C) 220^0**   (D) 160^0

24.   What is the EXACT length of the perimeter for this triangle?

(A) $16+8\sqrt{2}$
(B) $24\sqrt{2}$
(C)   24
(D) $8+16\sqrt{2}$

25.   The point $P(-1,3)$ lies on the terminal arm of an angle θ in standard position. What is the EXACT value for $\cos\theta$?

(A) $\dfrac{-1}{\sqrt{10}}$ (B) $\dfrac{3}{\sqrt{10}}$ (C) $\dfrac{-3}{\sqrt{10}}$ (D) $\dfrac{1}{\sqrt{10}}$

26.   Which of the following quadratic functions has a maximum y value of 6?
(A) $(y+6)=-(x-5)^2$
(B) $(y-6)=-(x+5)^2$
(C) $(y-5)=(x+6)^2$
(D) $(y-5)=(x-6)^2$

27.   What is the vertex form for the quadratic function $y=6x^2+12x-2$?
(A) $y=6(x+1)^2+4$ (B) $y=6(x+1)^2-2$
(C) $y=6(x+1)^2-4$ **(D) $y=6(x+1)^2-8$**

28.   A function has x-intercepts 3 and 10. If the maximum value of this function is 7, what are the coordinates of the function's vertex?

(A) $\left(-6.5,\ 7\right)$ **(B) $\left(6.5,7\right)$**   (C) $\left(6.5,-7\right)$ (D) $\left(-6.5,-7\right)$

29. What is the vertical stretch for the parabola with vertex (-1, 3) and an x-intercept at (-2, 0)?

(A) -3   (B) $-\frac{1}{3}$ (C) $\frac{1}{3}$ (D) 3

30. What is the axis of symmetry for the graph of the function $y = \frac{1}{2}(x-4)^2 + 5$?

(A) $x = 4$ (B) $x = 5$ (C) $x = \frac{1}{2}$ (D) $x = -4$

31. What is the range for the function $y = -2(x+5)^2 - 7$?

(A) $y \leq 5$ (B) $y \geq 5$ (C) $y \leq -7$ (D) $y \geq -7$

32. What is the y-intercept of the graph of $y = \frac{1}{2}(x-4)^2 + 3$?

(A) 11   (B) 7   (C) 3   (D) 5

33. Solve for x: $4x^2 + 28x = 0$

(A) $-4 \ and \ 7$ (B) $0 \ and \ 7$ (C) $0 \ and \ -7$ (D) $-4 \ and \ -7$

34. The discriminant for the quadratic function $y = a(x+1)^2 + 5$ whose graph opens down must be __.

(A) positive   (B) negative   (C) could be positive or negative   (D) 0

35. What is the value of the discriminant for the function $y = -2x^2 - 4x - 1$?

(A) -24   (B) $\sqrt{24}$ (C) 8   (D) $\sqrt{8}$

36. The quadratic formula results in the following calculation: $\dfrac{2 \pm \sqrt{(-2)^2 - 4(\frac{1}{2})(-1)}}{1}$.
How many x-intercepts will the graph of the related quadratic function have?

(A) none   (B) 2 equal ones   (C) 2 different ones   (D) not possible to tell

37. Completely factor $9(a-1)^2 - 16$.

(A) $(3a+1)(3a-7)$ (B) $(3a+1)(3a-1)$ (C) $(3a-1)(3a+7)$ (D) $(3a+4)(3a-4)$

38. What value of c makes $x^2 - 12x + c$ a perfect square trinomial?
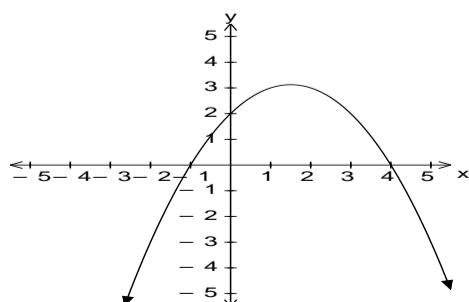
(A) -6   (B) 6   (C) -36   (D) 36

39. Which calculation below represents the zeros for the quadratic equation $-2x^2 - 5x + 8 = 0$?

(A) $\dfrac{-5 \pm \sqrt{5^2 - 4(-2)(8)}}{2(-2)}$ (B) $\dfrac{5 \pm \sqrt{-5^2 - 4(-2)(8)}}{2(-2)}$ NOTE: Missing brackets around -5 on -5 squared

(C) $\dfrac{5 \pm \sqrt{5^2 - 4(-2)(8)}}{-2}$ (D) $\dfrac{5 \pm \sqrt{5^2 - 4(-2)(8)}}{2(-2)}$
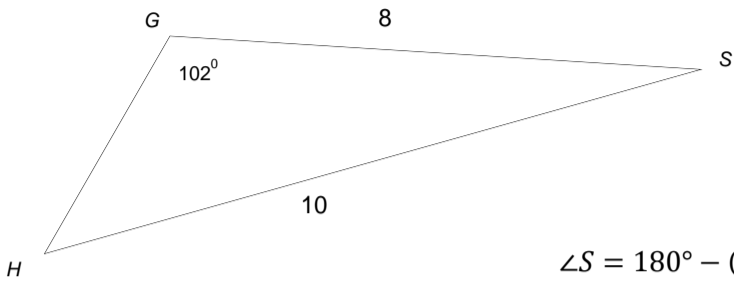
40. What are the roots for the following quadratic?

(A)   (1.5,3)
(B) $-1 \ and \ 4$
(C) $1 \ and \ -4$
(D)   not possible to identify the roots

Part B – Constructed Response – Show all workings for each of the following questions. (40 marks)

42. (A) Find all possible values, to the nearest tenth, of the missing sides and angles for $\triangle GHS$.
(This triangle is not drawn to scale) (5 marks)

G   8

102^0

S

10

H

$\angle S = 180° - (102° + 51.5°)$

$\angle S = 26.5°$

$\dfrac{\sin H}{8} = \dfrac{\sin 102°}{10}$

$\sin H = \dfrac{8\sin102°}{10}$

$H = \sin^{-1}\dfrac{8\sin102°}{10}$

$\angle H = 51.5°$

$\dfrac{s}{\sin26.5°} = \dfrac{10}{\sin102°}$

$s = \dfrac{10\sin26.5°}{\sin102°}$

$s = 4.6$

NOTE: Only one angle since $\angle G$ is obtuse

(B) Susan is welding three steal beams together to build a support. Find the missing angles (to the nearest tenth of a degree) for these specifications. (5 marks)

A

4.9m

2.7m

B   **3.2 m**   C
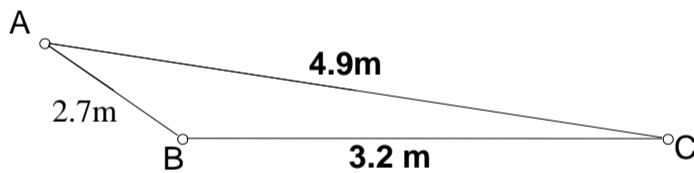
$cosC = \dfrac{3.2^2 + 4.9^2 - 2.7^2}{2(3.2)(4.9)}$

$cosC = \dfrac{26.96}{31.36}$

$C = \cos^{-1}\left(\dfrac{26.96}{31.36}\right)$

$\angle C = 30.7°$

$\dfrac{\sin A}{3.2} = \dfrac{\sin 30.7°}{2.7}$

$\sin A = \dfrac{3.2\sin30.7°}{2.7}$

$A = \sin^{-1}\dfrac{3.2\sin30.7°}{2.7}$

$\angle A = 37.2°$

$\angle B = 180° - (30.7° + 37.2°)$
$\angle B = 112.1°$

43. (A) Use completing the square to change $y = \frac{1}{2}x^2 - 2x + 1$ from Standard Form to Vertex Form. Sketch the quadratic. Identify the features requested. (6 marks)
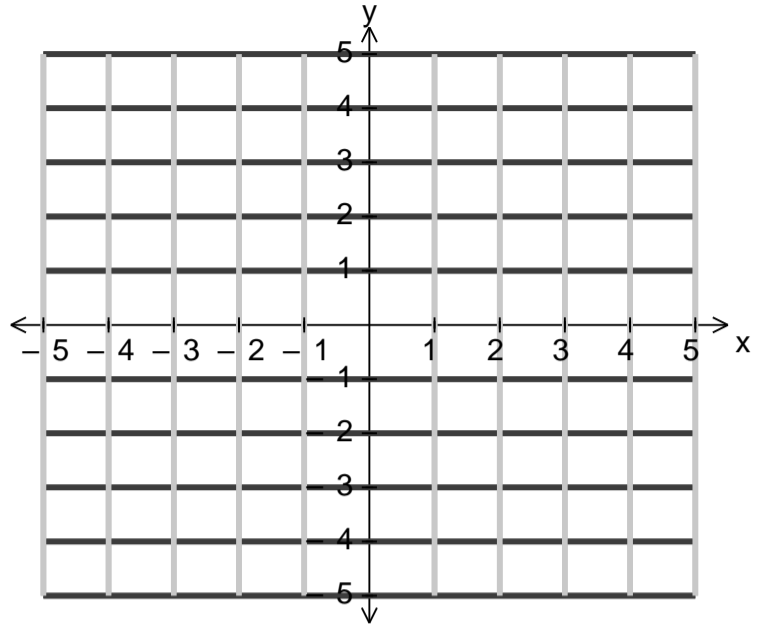
$y - 1 = \frac{1}{2}x^2 - 2x$

$y - 1 = \frac{1}{2}(x^2 - 4x)$

$y - 1 + \textcolor{red}{2} = \frac{1}{2}(x^2 - 4x + \textcolor{red}{4})$

$y + 1 = \frac{1}{2}(x - 2)^2$

$y = \frac{1}{2}(x - 2)^2 - 1$

Vertex: $(2, -1)$ Axis of Symmetry: $x = 2$ Range $y \geq -1$___   VS $\frac{1}{2}$

(B) Mark wants to increase the sales of his snowboarding video. Currently he is selling his product for $12 and is selling 500 a month. His research indicates that for every $1 price increase, he will sell 25 fewer products. Write and use a quadratic equation to find out how much Mark should charge in order to maximize his revenue. What is his maximum revenue? (4 marks)

$R = (500 - 25x)(12 + x)$

$R = 6000 + 500x - 300x - 25x^2$

$R = -25x^2 + 200x + 6000$

Max at Vertex: $x = \dfrac{-b}{2a} = \dfrac{-200}{2(-25)} = 4$

So Max Revenue is $R = -25(4)^2 + 200(4) + 600 = 6400$

44. (A) Solve both of the following quadratics by the method prescribed. Your solutions must be EXACT and be completely simplified. (3 marks each)

i. $0.25x^2 - 0.5x = 1.5$ (Quadratic Formula)

ii. $4x^2 + 27 = 24x$ (Factoring)

(B) Isabel has a favourite photo 10 cm by 15 cm that she wants to have matted. The mat is to be of equal width all around the outside of the photo. The mat and the photo together is to have an area of $500\ cm^2$. What should the width of the mat be? (4 marks)

$(2x + 10)(2x + 15) = 500$

$4x^2 + 30x + 20x + 150 = 500$

$4x^2 + 50x - 350 = 0$

$2x^2 + 25x - 175 = 0$

$(x - 5)(2x + 35) = 0$

$x - 5 = 0 \quad OR \quad 2x + 35 = 0$

$x = 5$ $\qquad OR \quad x = -\dfrac{35}{2}$