YUSOF ISHAK SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020

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CANDIDATE NAME	
CLASS	
INDEX NUMBER	

MATHEMATICS 4048/01
4 Express/5 Normal Academic

27 August 2020

Candidates answer on the Question Paper. **2 hours**

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces provided on the work you hand in.
Write in dark blue or black ink on both sides of the paper.
Do not use staples, paper clips, highlighters, glue ‘ correction fluid.

Answer **all** the questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is **80**.

Mathematical formulae

Compound interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

$$\text{Curved Surface area of a cone} = \pi rl$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

$$\text{Arc length} = r\theta \text{ , where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2}r^2\theta \text{ , where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

[3]

1 Write the following numbers in order of size, starting with the **largest**.

$$-\frac{22}{7}\ ,\ -\pi\ ,\ -3.142\ ,\ -3.\dot{3}$$

Answer: ……, ……, ……, …… [1]
largest *smallest*

---

2 Bob's test marks for six of his tests are listed below.

24	a	22	33	b	26

The median mark is 26.
The mean mark is 27.

Given that $a < b$, find the values of a and b.

Answer: a = ……..

b = …….. [2]

---

3 n is a positive integer.

Show that $(2n+1)^2-(2n-3)^2$ is a multiple of 8 for all integer values of n.

Answer

[2]

---

[4]

4 Simplify $\left(\frac{27x^9}{y^6}\right)^{-\frac{2}{3}}$.

Answer: …… [2]

---

5 One solution of the equation $5x^2 - px + 40 = 0$ is $x = 2$.

Find

(a) the value of p,

Answer: *(a)* p = …… [1]

(b) the second possible value of x.

Answer: *(b)* x = …… [1]

---

6 When it is 1100 in Singapore, the time in Dubai is 0700.
A flight from Singapore departs at 1510 and arrives at Dubai at 1825. Given that the distance from Singapore to Dubai is 5840 km, find the average speed of the plane in kilometres per hour.

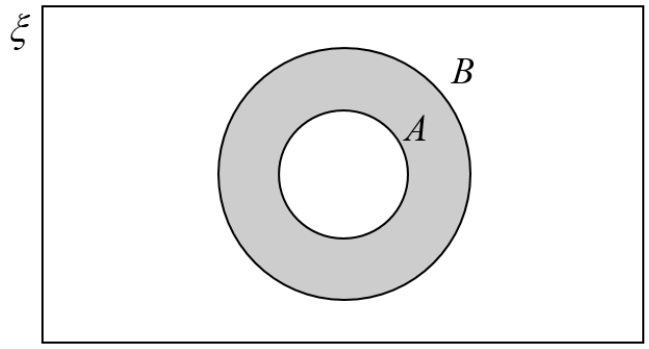
[5]

Answer: ..... km/h [2]

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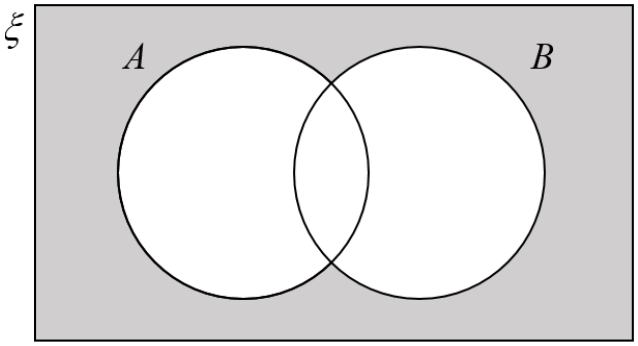
7 Write down the sets represented by the following shaded regions.

(a)



Answer: *(a)* ..... [1]

(b)



Answer: *(b)* ..... [1]

---

[6]

8

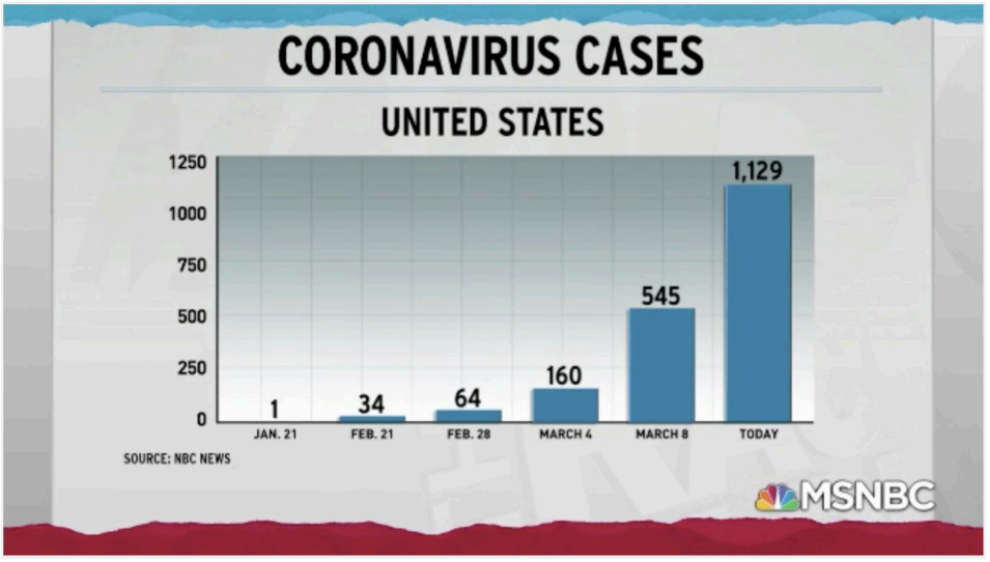


Figure 1: Bar graph showing the number of Coronavirus Cases in United States (Source: NBC NEWS)

(a) State one misleading feature about the presentation of the data in Figure 1.

……

…… [1]

(b)

1

Figure 2: Bar graph showing the number of new coronavirus cases in Singapore everyday (Source: Channel News Asia)

After studying the trend in Figure 2, Sam claims that the total number of Coronavirus cases in Singapore will decrease in April.

Do you agree with Sam? Explain your answer.

……

……

…… [1]

[7]

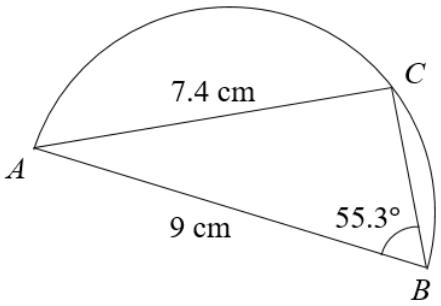
9 To purchase a washing machine, Jamie had to pay a deposit of 15% of the cash price.

The hire-purchase price of the washing machine is \$2106 which comprises of the deposit plus 12 equal monthly payments of \$153.

Find the cash price of the washing machine.

Answer: \$ …… [3]

10



In the diagram, A, B and C are points on a circle.

$AB = 9$ cm, $AC = 7.4$ cm and angle $ABC = 55.3°$.

Explain why AB is not the diameter of the circle.

Answer: ……

……...

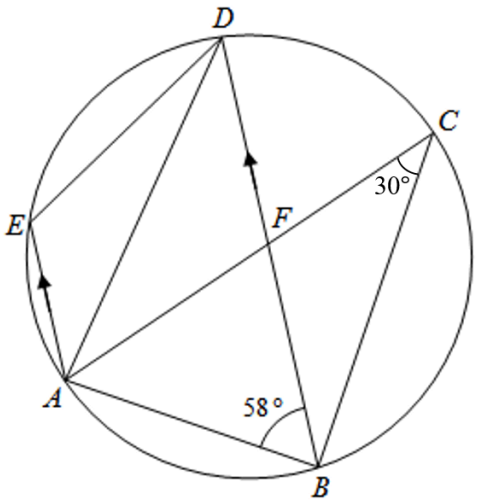
……...

……... [3]

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[8]

11 In the diagram, A, B, C, D and E are points on a circle.
AC is a diameter of the circle and AE is parallel to BD.
F is the point of intersection of AC and BD.



Given that angle $ABD = 58°$ and angle $ACB = 30°$, find

(a) angle DBC,

Answer: *(a)* ……° [1]

(b) angle AED,

Answer: *(b)* ……° [1]

(c) angle ADE.

Answer: *(c)* ……° [1]

[9]

12 **(a)** 5 men take 9 days to build a house. How many days would 3 men take to build the house?

Answer: *(a)* ……days [1]

(b) The volume of water, V m^3, flowing through a cylindrical pipe is directly proportional to the square of its cross-sectional radius, R m. If the radius of the pipe is increased by 150%, find the percentage increase of the volume.

Answer: *(b)* ……% [2]

[10]

13 The test results of 40 students from Class *A* and 40 students from Class *B* were recorded. The results are shown in the stem-and-leaf diagram.

Class *A*		Class *B*
9 8 8 7 5 3	0	3 4 4 5
8 8 7 7 6 5 4 4 1 0	1	3 3 5 6 8 8 8 8 9
7 7 6 6 5 3 1 1	2	2 2 4 4 5 6 6 7 8 8
9 9 7 4 4 3 1 0 0	3	0 0 1 1 2 2 3 5 5 9
9 9 8 7 7 6 5	4	1 2 2 4 4 5 9

Key (Class *A*)
1 | 2 means 21

Key (Class *B*)
1 | 3 means 13

(a) Write down the median result of Class *B*.

Answer: (a) ..... [1]

(b) Make one comment comparing the test results of Class *A* and Class *B*.

Answer: (b)

.....

.....

.....

..... [2]

14 **(a)** Express 1176 as the product of its prime factors.

Answer: *(a)* ..... [1]

(b) Two integers, written as product of their prime factors, are

$$2^p \times 3 \times 7^q \text{ and}$$

$$2^2 \times 3^r \times 7^2 .$$

The highest common factor of these two integers is 12 and the lowest common multiple of these two integers is 1176. Find the values of p, q and r.

Answer: *(b)* p = ...

q = ...

r = ... [3]

---

15 Factorise completely

(a) $27a^2b - 48b^3$,

Answer: *(a)* ..... [2]

(b) $28dy - 4y - 7d + 1$.

Answer: *(b)* ..... [2]

---

[12]

16 Rearrange the formula $t = 2\pi\sqrt{\frac{h+g}{h}}$ to make h the subject.

Answer: ……..… [4]

---

17 The points $(-1,\ 4)$, $(2,\ -5)$ and $(0,\ -3)$ lie on the curve given by the equation $y = ax^2 + bx + c$. Use an algebraic method to find the values of a, b and c.

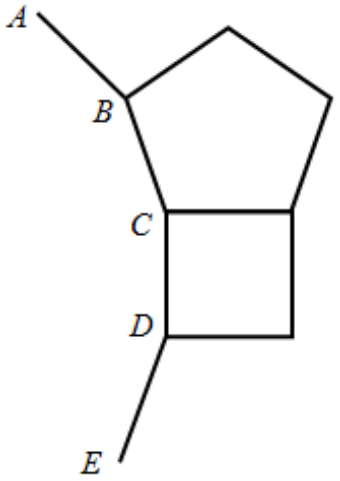
Answer: a = ……

b = ……

c = …… [4]

---

18 The diagram shows an incomplete n-sided regular polygon $ABCDE$, a square and a pentagon. The polygons fit together at C. Find the value of n.



Answer: n = …… [4]

---

19 The ratio of the surface areas of two geometrically similar pyramids is 64 : 121.

(a) Find the ratio of the volume of the smaller pyramid to the volume of the larger pyramid.

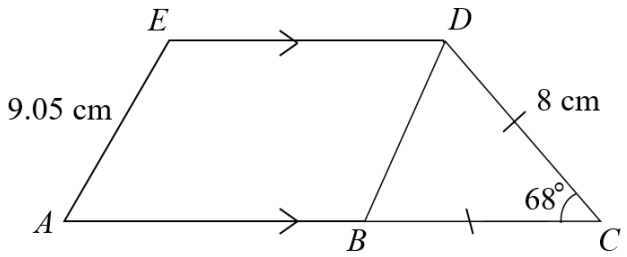
Answer: *(a)* …… : …… [2]

(b) Given that the volume of the smaller pyramid is 921.6 cm^3, find the volume of the larger pyramid.

Answer: *(b)* ……cm^3 [2]

---

20 $ACDE$ is a trapezium. B is a point on AC such that $BC = DC = 8$ cm, angle $BCD = 68°$ and $AE = 9.05$ cm.



(a) Show that the height of trapezium $ACDE$ is 7.417 cm, correct to 3 decimal places.

Answer

[2]

(b) Explain why AE is not parallel to BD.

Answer: *(b)* ……

……

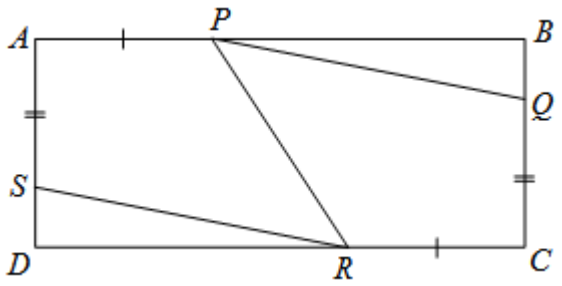
…… [2]

(c) Given that the area of $ACDE$ is 111 cm^2, find the area of $ABDE$.

Answer: *(c)* ……cm^2 [2]

[15]

21 $ABCD$ is a rectangle. Points P, Q, R and S lie on AB, BC, CD and DA respectively such that $AP = CR$ and $QC = SA$.



(a) Giving reasons clearly,

(i) show that $PB = RD$,

Answer (a)(i)

[1]

(ii) show that triangle PBQ is congruent to triangle RDS.

Answer (a)(ii)

[2]

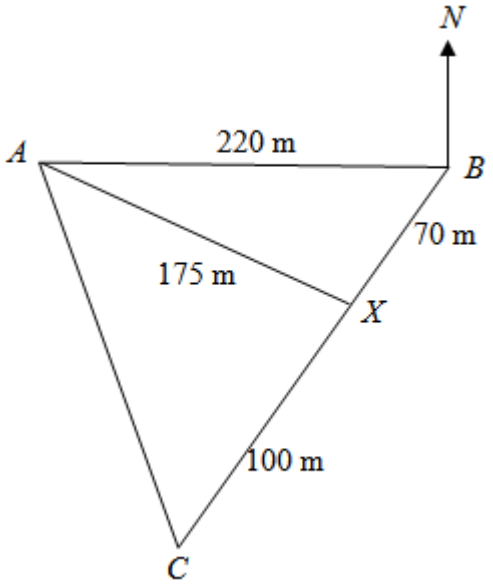
(b) Given that angle $BPQ = 20°$ and angle $APR = 105°$, find angle PRS.

Answer: (b) $\angle PRS =$ ..... ° [1]

[16]

[17]

22 A, B and C are three points on a horizontal field. A is 220 m due west of B.
X is a point on BC such that $BX = 70$ m, $CX = 100$ m and $AX = 175$ m.



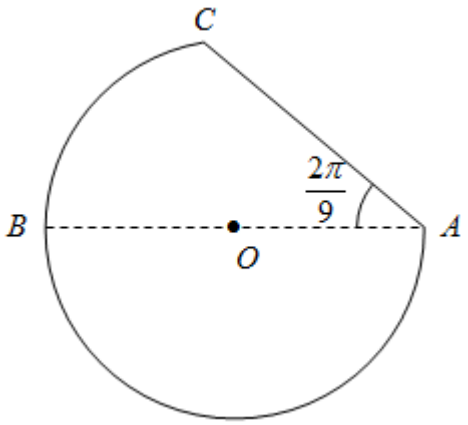
(a) Calculate the bearing of C from B.

Answer: *(a)* ……° [3]

(b) Calculate the shortest distance from X to AB.

Answer: *(b)* …….. m [2]

23 The diagram shows a major segment of circle ABC with centre O.



(a) Given that $AB = 24$ cm and angle OAC is $\frac{2\pi}{9}$ radian, show that the length of the arc $BC = 16.8$ cm, correct to 3 significant figures.

Answer

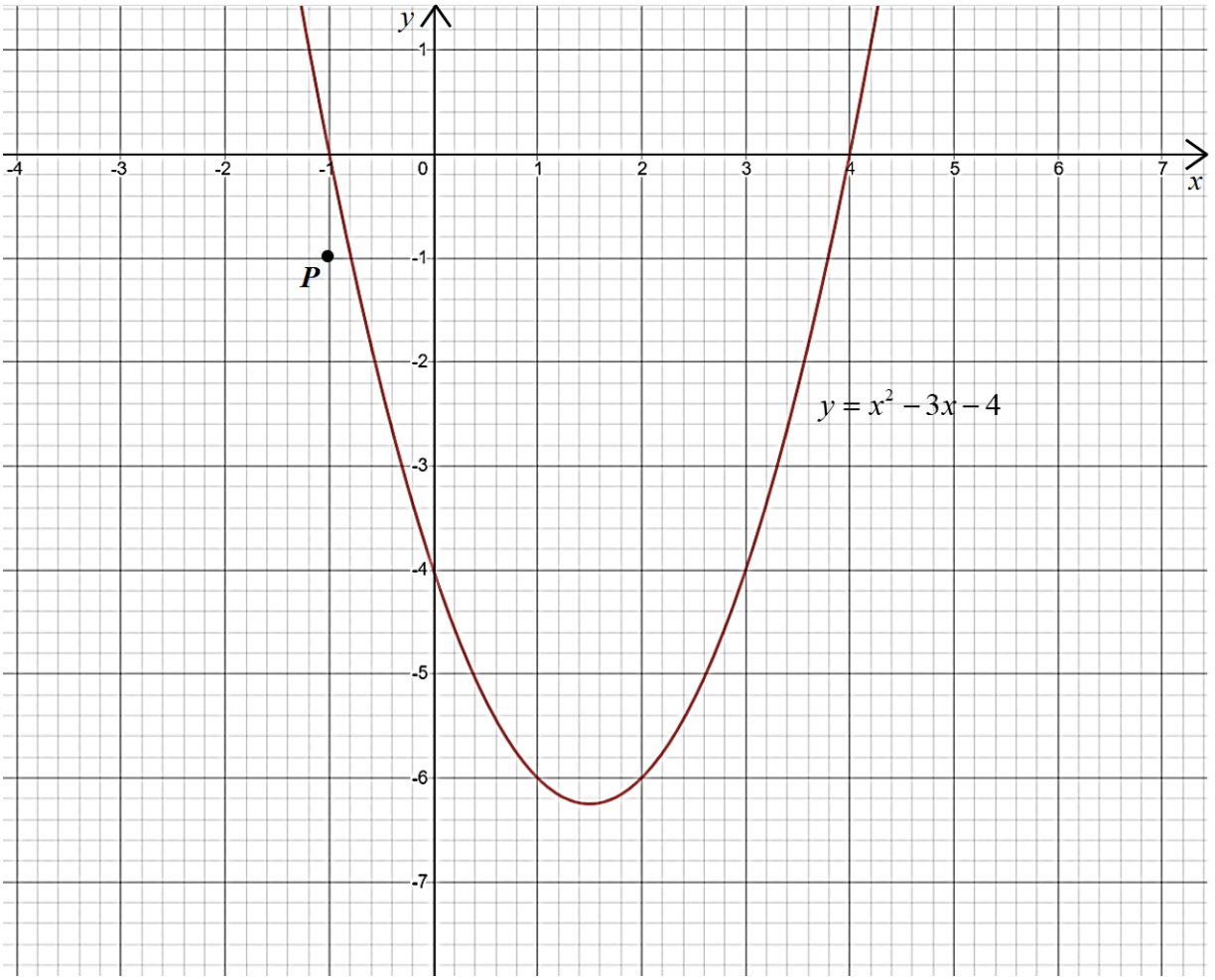
[2]

(b) Hence, find the perimeter of the major segment ABC.

Answer: *(b)* ..... cm [3]

[19]

24 The graph of $y = x^2 - 3x - 4$ is drawn on the grid.



(a) Write down the equation of the line of symmetry of the curve.

Answer: *(a)* ..... [1]

(b) Use the graph to solve the equation $x^2 - 3x - 1 = 0$.

Answer: *(b)* x = ... or ..... [2]

[Continued

[20]

(c) The point P has coordinates $(-1, -1)$.

A tangent to the curve can be drawn so that the tangent passes through P.

(i) Draw this tangent on the grid above. [1]

(ii) Find the equation of this tangent.

Answer: *(c)(ii)* …… [2]

End of Paper