Mathematics 30–1

Released Items

2014 Released Diploma Examination Items

Alberta Government

For further information, contact

Ross Marian, **Assessment Standards Team Leader**, at
Ross.Marian@gov.ab.ca

Susan Gale, **Examiner**, at
Susan.Gale@gov.ab.ca, or

Deanna Shostak, **Director of Diploma Programs**, at
Deanna.Shostak@gov.ab.ca, or

Assessment Sector: (780) 427-0010.
To call toll-free from outside Edmonton, dial 310-0000.

The Alberta Education website is found at education.alberta.ca.

Contents

Introduction

The questions in this booklet are a sample set of questions from the November 2012 and the January 2014 Mathematics 30–1 Diploma Examinations. Teachers may wish to use these questions in a variety of ways to help students develop and demonstrate an understanding of the concepts described in the *Mathematics 30–1 Program of Studies*. This material, along with the *Program of Studies*, *Information Bulletin*, and the *Assessment Standards and Exemplars* can provide insights that assist you with decisions about instructional planning.

These questions are released in both English and French by the Assessment Sector.

Additional Documents

The Assessment Sector supports the instruction of Mathematics 30–1 with the following documents available online at www.education.alberta.ca.

- *Mathematics 30–1 Information Bulletin and Mathematics 30–1 Assessment Standards and Exemplars*
  Available at education.alberta.ca.
  From the home page, follow this path:
  Teachers > (Additional Programs and Services) Diploma Exams > Information Bulletins.
  Contains information about the diploma examinations for the upcoming school year, and sample questions.

- *School Reports and Instructional Group Reports*
  Available at https://phoenix.edc.gov.ab.ca/login.
  Detailed statistical information on provincial, group, and individual student performance on the entire examination.

Mathematics 30–1 Diploma Examination November 2012 and January 2014 – Blueprint Summary

The following table gives results for the machine-scored questions released from the examination and shows the percentage of students that answered each question correctly. For each question, the table also gives the correct response, the topic, the outcome, the standard, and the cognitive levels.

Topics

RF Relations and Functions
TRIG Trigonometry
PCBT Permutations, Combinations, and Binomial Theorem

Standards

AC Acceptable
SE Excellence

Cognitive Level

C Conceptual
P Procedural
PS Problem Solving

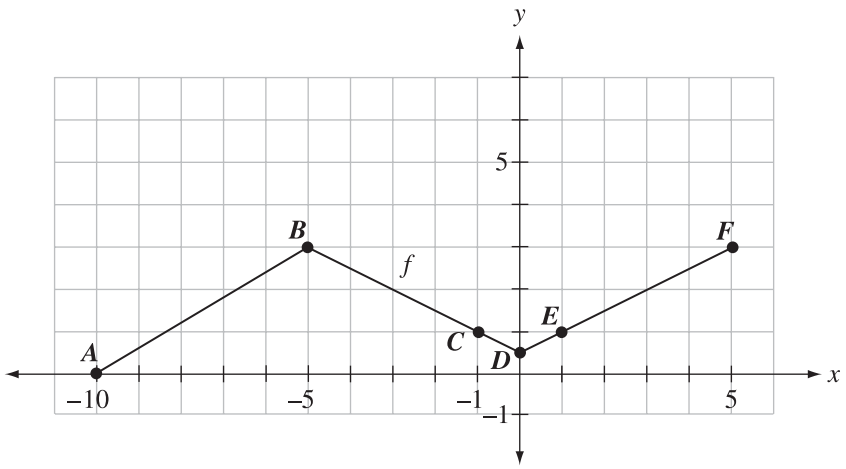
Released Item	Diff.*	Key	Topic	Outcome	Cognitive Level	Standard	Original Question
MC 1	76.9%	A	RF	3	C	A	Nov 2012 MC1
MC 2	47.6%	B	RF	6	C	A	Nov 2012 MC3
MC 3	76.9%	C	RF	7	C	A	Nov 2012 MC5
MC 4	78.2%	C	RF	10	PS	E	Nov 2012 MC6
MC 5	59.2%	D	RF	9	PS	A	Nov 2012 MC7
NR 1	53.1%	2.02	RF	8	P	A	Nov 2012 NR4
NR 2	55.8%	145(AO)	RF	12	C	A	Nov 2012 NR6
MC 6	78.2%	B	RF	11	P	A	Nov 2012 MC10
MC 7	21.2%	D	TRIG	1	PS	E	Jan 2014 MC17
MC 8	78.4%	C	TRIG	2	C	A	Jan 2014 MC19
MC 9	73.6%	A	TRIG	6	PS	E	Jan 2014 MC23
MC 10	72.8%	B	TRIG	4	PS	E	Nov 2012 MC20
NR 3	71.4%	60	PCBT	2	PS	A	Nov 2012 NR11
MC 11	38.4%	C	PCBT	2	C	A	Jan 2014 MC26
MC 12	59.2%	A	PCBT	4	PS	E	Nov 2012 MC28

*Difficulty—proportion of students answering the question correctly

Mathematics 30–1 Diploma Examination
November 2012 and January 2014 – Released Items

Use the following information to answer the first question.

The graph of $y = f(x)$ is shown below.



1. The graphs of $y = f(x)$ and $y = 3f(x)$ intersect at

A. Point A

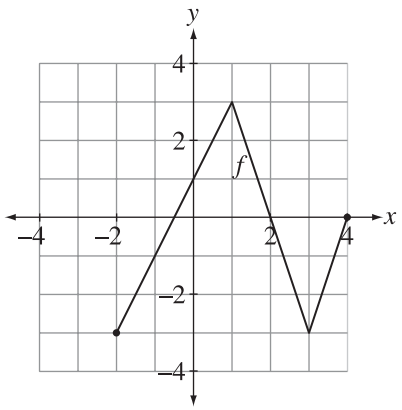
B. Point D

C. Points B and F

D. Points C and E

Use the following information to answer the next question.

The graph of $y = f(x)$ is shown below.



2. When the graph of $y = f(x)$ is reflected in the line $y = x$, the number of invariant points is

A. one
B. two
C. three
D. four

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3. If $\log_x y = a$, then an equivalent expression for y^2 is

A. a^x
B. a^{2x}
C. x^{2a}
D. $2x^a$

Use the following information to answer the next question.

Earthquake intensity, I, is given by the equation

$$I = I_0(10)^m,$$

where m is the magnitude measured to the nearest tenth on the Richter scale and I_0 is the reference intensity.

In 1906, the San Francisco Bay area had an earthquake with a magnitude of 7.8 on the Richter scale.

4. What is the magnitude of an earthquake that is 158 times **less** intense than the 1906 San Francisco Bay earthquake?

A. 2.2

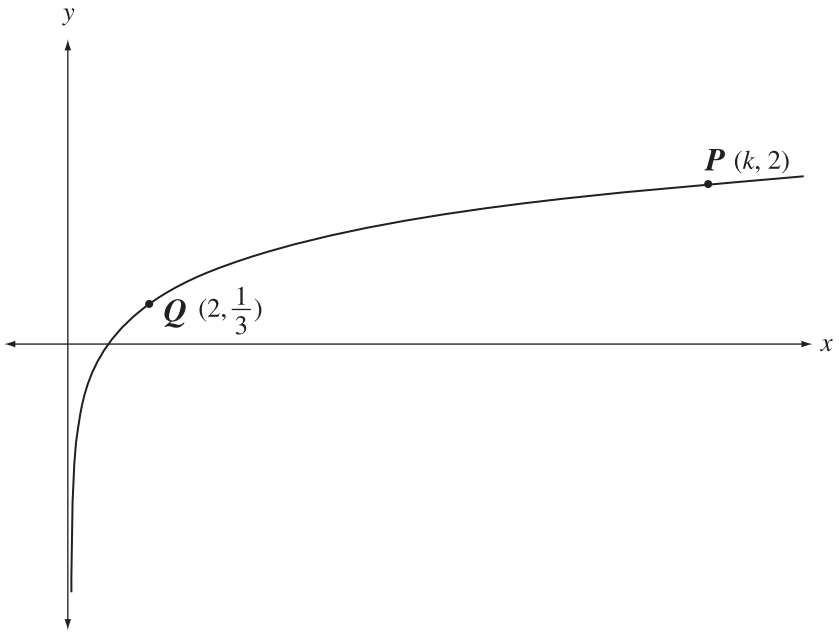
B. 3.5

C. 5.6

D. 6.3

Use the following information to answer the next question.

Points $P(k, 2)$ and $Q\left(2, \frac{1}{3}\right)$ lie on the partial graph of $y = \log_b x$, as shown below.



5. The value of k is

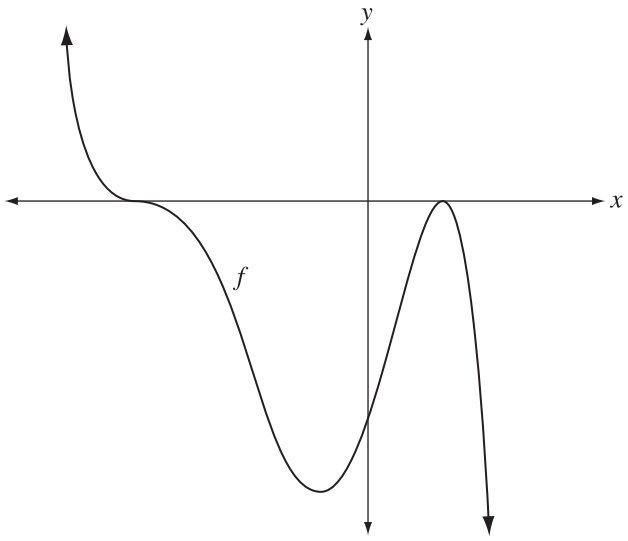
A. 8
B. 12
C. 36
D. 64

Numerical Response

1. If $\log_5 x - \log_5(x - 2) = 3$, then the value of x, to the nearest hundredth, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.



The following are some possible characteristics of the graph of $y = f(x)$ above.

Equation	Sign of a	Values of b and c
1 $y = a(x - b)^2(x - c)^3$	**3** Positive	**5** $b > 0$ $c < 0$
2 $y = ax(x - b)(x - c)^3$	**4** Negative	**6** $b < 0$ $c > 0$

Numerical Response

2. The characteristics that describe the function $y = f(x)$ are _____, _____, and _____.

(Record all **three digits** of your answer **in any order** in the numerical-response section on the answer sheet.)

6. Which of the following binomials is a factor of the polynomial function $f(x) = 3x^3 + 8x^2 - x - 10$?

A. $(x + 1)$

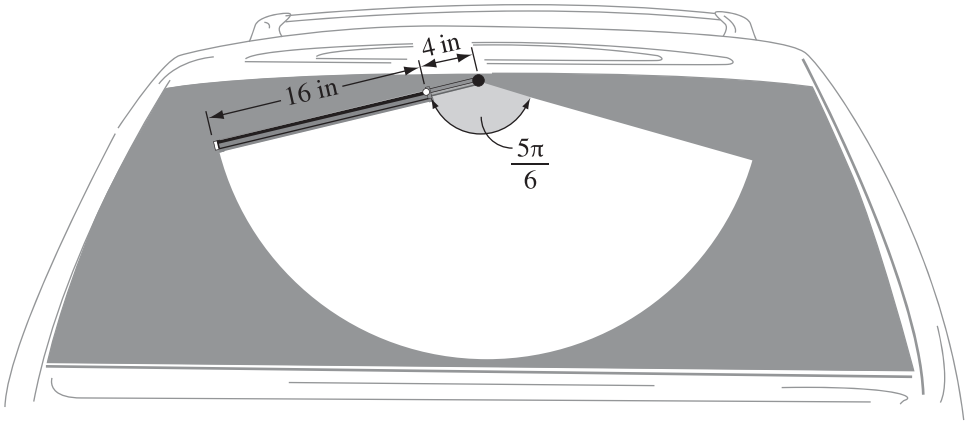
B. $(3x + 5)$

C. $(x + 10)$

D. $(3x + 2)$

Use the following information to answer the next question.

The wiper on the rear window of a particular car moves through an angle of $\frac{5\pi}{6}$ rad in a single sweep and clears a region that is 16 in wide, as shown in the diagram below.



7. The total perimeter of the cleared region, to the nearest inch, is

A. 52 in
B. 63 in
C. 84 in
D. 95 in

Use the following information to answer the next question.

Point $A(x, y)$ is the intersection point of the unit circle and the terminal arm of 145° in standard position.

8. The coordinates of Point A, to the nearest hundredth, are

A. (–0.57, 0.82)
B. (0.57, –0.82)
C. (–0.82, 0.57)
D. (0.82, –0.57)

9. An expression that is equivalent to $\frac{\cos(2x) + 2\sin^2 x}{1 + \tan^2 x}$, where $x \neq \frac{n\pi}{2}$, $n \in I$, is

A. $\cos^2 x$

B. $\sin^2 x$

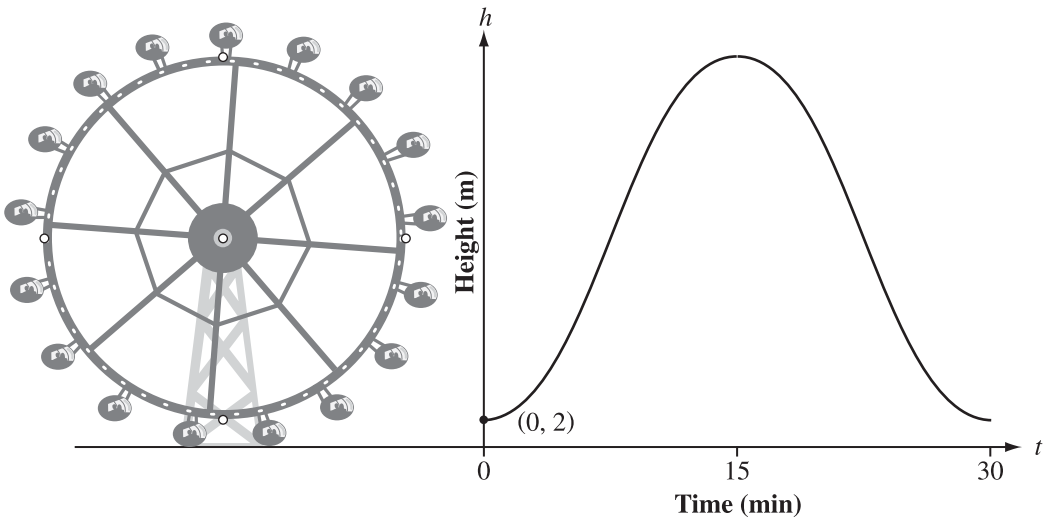
C. $\frac{1}{\cos^2 x}$

D. $\frac{1}{\sin^2 x}$

Use the following information to answer the next question.

The London Eye is an observation wheel with a radius of 68 m. Rides consist of one complete revolution, which takes 30 minutes, and begin on a platform 2 m above the ground.

The height, $h(t)$, in metres, of a rider above the ground as a function of time, t, in minutes, can be expressed as $h(t) = a\sin\left[b(t - c)\right] + d$.



10. Which of the following equations could represent the function $h(t)$?

A. $h(t) = 68\sin\left[\frac{\pi}{15}(t + 7.5)\right] + 68$

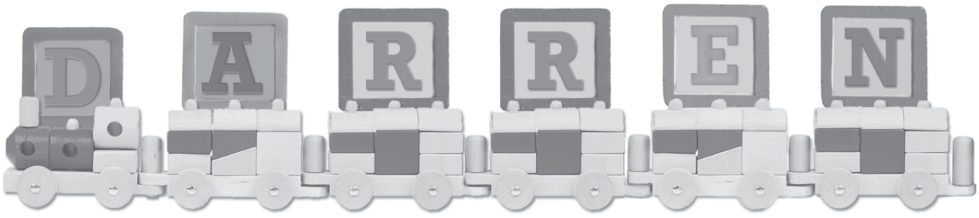
B. $h(t) = 68\sin\left[\frac{\pi}{15}(t - 7.5)\right] + 70$

C. $h(t) = 34\sin\left[\frac{\pi}{30}(t + 7.5)\right] + 70$

D. $h(t) = 34\sin\left[\frac{\pi}{30}(t - 7.5)\right] + 68$

Use the following information to answer the next question.

Two-year-old Darren is playing with a train set that has an engine and detachable train cars. The letters are glued to the engine and the cars, and the two cars with the letter **R** are identical. Darren does not know how to spell his name, but he knows that the engine with the letter **D** must be in front.



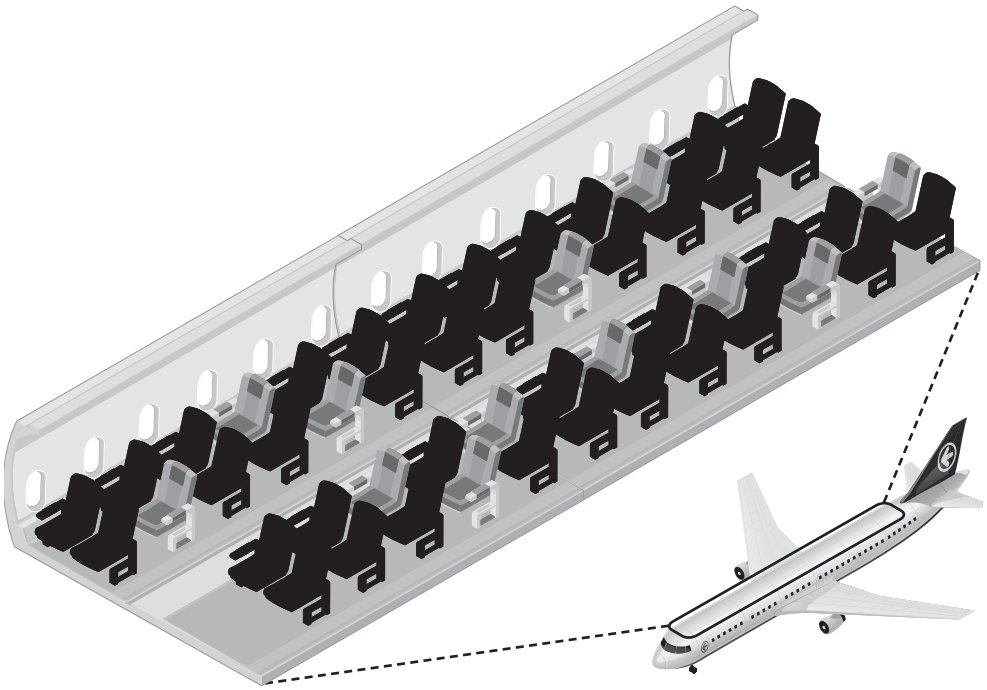
Numerical Response

3. The total number of different possible arrangements of all the train cars, with the engine in front, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

The diagram below shows a website seating chart for an aircraft. The seats shaded black have been reserved and the lighter-shaded seats are available. There are 12 seats available at this time.



11. If 7 customers are each booking one seat, then the number of different ways that they could be assigned a seat is

A. 7!

B. $\frac{12!}{7!}$

C. ${}_{12}P_7$

D. ${}_{12}C_7$

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12. For the general term t_{k+1} in the expansion of $\left(x^a + y\right)^n$, written in descending powers of x, the exponent of the variable x is

A. $an - ak$

B. $ak + a$

C. $an + a$

D. $n - k$